

PATHWAYS

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No. 1

STRAW EXPERIMENTS (II)

In the previous issue of the Pathways (Nov / Dec. 1982), the write-up 'Straw Experiments (I)' had five relatively easy straw experiments. In this issue five more straw experiments have been described which require the collection of quite a few observations and their interpretation. The activities have been kept open-ended so as to give students the thrill of discovery.

6. A. STRAW ELECTROSCOPE

Take a plastic straw and pass a pin through it slightly above its centre. Place the straw on two beakers as shown such that it stays upright (Fig. 6). Rub the upper portion of the straw with a piece of cotton cloth. Bring another plastic straw rubbed with the cotton cloth piece near the first straw. You will observe repulsion causing the first straw to deflect.

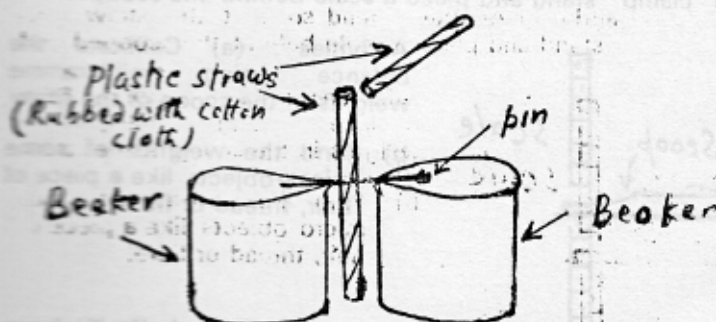


Fig. 6. Straw Electroscope

Activities : (a) Investigate how the deflection of the first straw changes with the distance between the two straws.

- b) Investigate how the deflection of the first straw changes with the number of times the second straw is rubbed with the cotton cloth piece.

7. THE CONDITIONS FOR STABILITY

Make a straw structure as shown in Fig. 7 using Fevicol to stick the straws. Patience is needed as Fevicol takes some time to dry and join the pieces firmly. Tie a piece of thread carrying a paper clip to the straw along the centre of the structure. The thread with the clip works as a plumb-line.

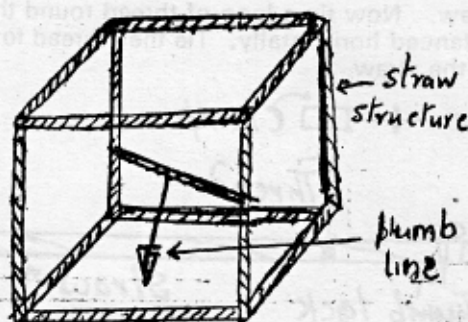


Fig. 7. Testing for Stability

Activities : (a) Tilt the structure and find the relation between the position of the plumb line and the base when structure topples over.

- b) Repeat the activity (a) with other structures with different base areas and heights. Comment on their relative stability.

8. A STRAW EVAPORATION GAUGE

Take a soft-wood board and fix it in a vertical position using clamps. Fix a pin on the board. Now take a straw and pass a filter paper piece through it as shown in Fig. 8. Tie a loop of thread around the straw and shift the thread along the straw so that it is balanced. Tie the thread to the pin on the board and fix a millimetre graph paper strip behind the straw to work as a scale. Put a drop of some volatile liquid on the paper piece. The straw will show a deflection which changes with time as the liquid evaporates.

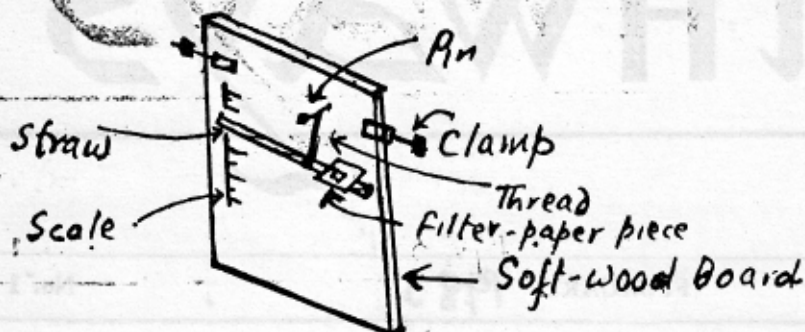


Fig. 8. Evaporation Gauge

Activities : (a) Find out the time taken by the straw to deflect through a fixed distance on the scale as the volatile liquid evaporates.

b) Compare the rates of evaporation of different liquids like ether, alcohol, carbon bisulphide, spirit etc.

9. THE PRINCIPLE OF MOMENTS

Take a straw and tie a loop of thread, near its centre. Position the thread such that the straw gets balanced horizontally. Tie the thread to a clamp stand. Slip onto the straw three razor blades as shown. Position the blades so that straw is balanced. Take the weight of one blade as the arbitrary unit of force. Calculate the clockwise and anticlockwise moments.

Activities : (a) Verify the law of moments using the set-up.

b) Find out the weight of a paper clip in terms of the weight of a blade.

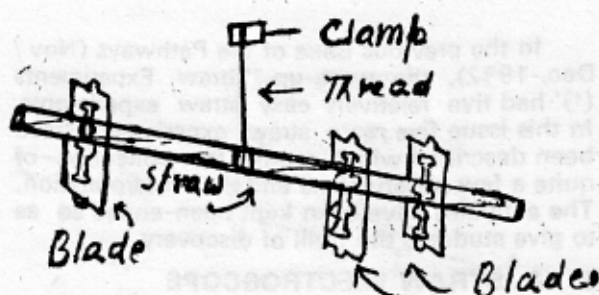


Fig. 9. The Law of Moments

10. A STRAW MICROBALANCE (SUSPENSION TYPE)

Take a straw and put a thumb tack near one of its ends. Cut a scoop at the other end of the straw. Now tie a loop of thread round the straw and position the thread so that the straw gets balanced horizontally. Tie the thread to a clamp stand and place a scale behind the scooped end of the straw.

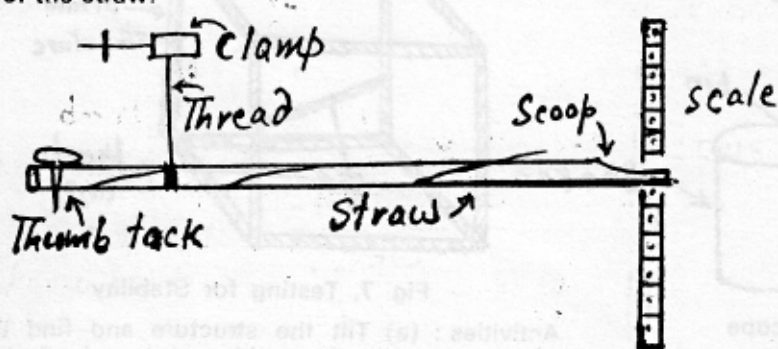


Fig. 10 Straw Microbalance

Activities : (a) Calibrate the balance using milligramme weights in the scoop of the straw.

b) Find the weights of some micro-objects like a piece of hair, thread or fibre.

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STUFFY TOYS

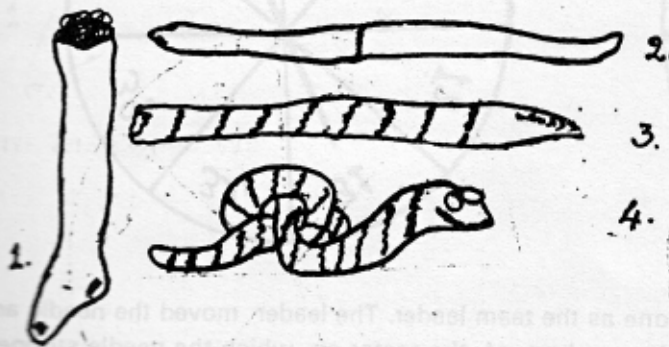
Do you have an old pair of socks, a T-shirt or a pullover that is too small or full of holes? If your clothes are too worn out to wear, they are just right for starting a new life as toys. This is what you will need :

- * scissors
- * clean old rags or foam rubber
- * coloured thread
- * a strong needle with a large eye
- * permission to cut up the old clothes.

THE SIMPLE SERPENT

materials : a pair of long socks.

1. Stuff both socks with old rags or foam rubber.
2. Sew the socks together with coloured thread at the open ends. Now choose one end of the serpent to be the tail. Stitch along the toe of the sock tapering it to make a thin tail.
3. Make cross-stitch stripes around your serpent with coloured thread so that no one will notice the stripe where the stockings are joined together. Add some button eyes and a smiling wool mouth.
4. If you have small bells, attach them to the tail and your serpent will become a musical rattlesnake.



THE WISE OLD OWL

material : a patterned or striped pullover, a scrap of plain-coloured cloth.

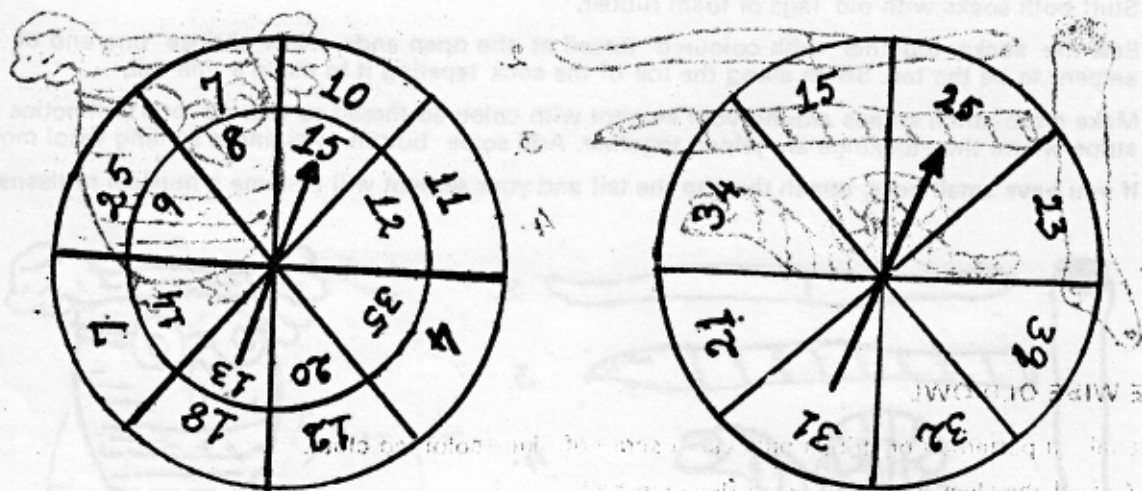
1. Cut off the sleeves and cut each sleeve in half.
2. Turn the pullover inside out and stitch in a curved line from one armhole past the neckline around to the other armhole. Now you have a kind of rounded pullover sack. Turn the sack right side out, stuff it with foam rubber or old rags, and stitch the top closed.
3. To make the owl's ears, use the upper half of both sleeves. With your scissors, round one edge of each sleeve. Stitch the rounded edge closed to keep the thread from unravelling, then gather the opposite edge.
4. To make the owl's feet, use the lower half of both sleeves. Gather each of these half-sleeves in the middle.
5. Make a small triangular pocket out of the scrap of plain-coloured cloth, and stuff it with old rags or foam rubber. This forms the beak.
6. Sew 2 buttons on for eyes, then sew on the beak. Attach the two ears to the top corners of the owl's body. Then attach the feet to the bottom of the rounded part of the owl's body. Add an old pair of spectacles - the frames will do to show how wise your owl is.

(Reproduced from Teach-In by the kind courtesy of Springdales Teachers Centre, New Delhi.)

An Interesting Game for Children in Primary Classes

It often happens that some children in a class finish their work earlier than others. At that time they are free and can create indiscipline in the class. To tackle this problem, especially in the mathematics class, I used the game described here. After teaching the children addition and subtraction, I introduced them to this game.

I took a piece of cardboard and cut a large circle. Plain white paper was pasted on both sides of the circle. On one side, two concentric circles were drawn as shown in the figure. These were divided into eight sectors. The other side of the cardboard was divided into eight matching sectors. Numbers to be added were written in the sectors of the concentric circles and the answers were written on corresponding sectors on the reverse side. Two needles, one on each side, were fixed at the centre. They were mounted at two ends of the same axle so that they would point to corresponding sectors on both sides of the cardboard.



I took four children and appointed one as the team leader. The leader moved the needle and asked the other children in turn to add up the numbers of the sector on which the needle stopped. If a child gave the right answer he would get two marks. Again the needle was rotated and where it stopped the second child was asked to sum up the numbers quickly. The answers at the back helped the leader to find out if the others were correct or not. The child who scored the maximum marks was the winner in the group. The leadership of the groups was changed after a few rounds so that all children went through the exercise in mental arithmetic.

The same idea may be introduced for subtraction operations by keeping the larger numbers in the outer sectors and smaller ones in the inner sectors.

The children found this game very interesting. It kept them busy when they had finished their routine class work. The problem of indiscipline was solved. Each child tried to do his best so as to be

declared the winner. Through play the children are able to practice addition and subtraction orally, they are able to count quickly, and their number skills are sharpened. It has been observed that this game is useful in their daily life too when they have to deal with money and similar quantities. Playing also gives them a sense of self-confidence.

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Editor's Note: The same idea can be used as a teaching aid for practice in a variety of mathematical skills. Many circular cards can be made or it may be possible to find a way of changing the figures on the first card; perhaps by slipping number cards into slits cut in the cardboard circle. Here are some possibilities :

1. Simple addition facts to build up number concepts.
 - i. increasing in steps of one
 $0+1$, $1+1$, $2+1$, $3+1$, $4+1$
 - ii. increasing in steps of two, three, five etc. (skip counting)
 $0+2$, $1+2$, $2+2$, $3+2$
2. Simple subtraction facts.
 $10-1$, $10-2$, $10-3$, $10-4$
 $10-2$, $9-2$, $8-2$, $7-2$
3. Addition and subtraction figures which give same answer.
 $5+9$, $2+12$, $6+8$, $3+11$, $10+4$
 $25-3$, $27-5$, $29-7$, $32-10$
4. Addition and subtraction of random numbers
 - i. single digits not exceeding nine
 - ii. double digit numbers—these may involve carrying over and borrowing, as the sums become more difficult.
5.
 - i. Multiplication practice of the same table.
 - ii. Random multiplication sums
 - iii. Different factors of the same number.
 2×6 , 4×3 , 6×2 , 12×1
 5×4 , 4×5 , 2×10 , 20×1
 3×16 , 4×12 , 6×8 , 2×24
6. Sums involving money.
 - i. Expressing rupees in paise and vice versa—involves ability to shift the decimal point, e.g. Rs. 2.75—275 p
 - ii. Addition sums without carrying over, e.g. Rs. 4.53 + Rs. 2.16
 With carrying over, e.g. Rs. 1.35 + Rs. 3.75
 - iii. Subtraction sums with and without borrowing
7. Similar sums on length, weight, capacity in the Metric system.

History Made Interesting

Ask most students about History and they will tell you how awful it is. Ask them why and how and they'll tell you it's boring and dull; dry and full of dates (needless to say the non-edible ones!). For any teacher of History it is important to convince the students that dates, although some of them are very important, are not the be all and end all of the subject. Equally important is for the teacher to establish the link between History and Now; to show that History is not irrelevant to our times. This kind of approach awakens an interest in even the most confirmed I—Hate—History fanatics.

Most students have an aversion to History also because it usually does not involve them as much as other subjects which have "practicals" as their added attraction. Wherever it is possible practicals in History should be given/used so as to break the monotony of "just the teacher's voice". When I was teaching the 9th classes History at the Lawrence School, Sanawar, I experimented a lot with practicals in History and used models more than words. Verbosity is yet another common complaint against History! I found the results of my experiments very encouraging, so I was given the impetus to experiment and adventure into new avenues.

I would like to share one of my experiments with you. One of the many things that a teacher keeps coming up against where experimental methods of teaching are concerned is the rigidity of the given Text Book, Syllabus and exam-oriented systems. Because one has to work within this given structure, experiments of any kind become more difficult. Even the students, especially the older ones, come out with "but this is useless where the exam is concerned". The idea is to do the textbook but have some fun while one is about it. The story of Civilisation Vol. 1 (for class IX) is a prescribed NCERT textbook. It is informative (no doubt about that) but is also long-winded and repetitive.

To get started on my project, I needed the fullest cooperation of my students. To get them all interested, I began with a favourite comic strip, the Flintstones. The very name 'Flintstones', the period setting etc were the topics of discussion. We looked at details in the illustrations as well. When I had them interested enough, I asked them to consider questions about Man and Civilisation—what civilisation meant, why the changes from food gathering to food producing and from hunting to domesticating animals. These were to be answered without consulting the textbook. After discussion, we took up textbook material. Then we decided that groups of students in the class would deal with different aspects of the first chapter and teach it to the rest. My job would just be supervision and summing up. One group took up "shelter", another "weapons", yet another "clothing" and so on. Each group did some reference work on their particular topic and came out with superb models and charts. They would come to me for ideas once in a while as regards material—for sitting on top of the hill as we were, there wasn't much one could buy!

Using bits of leather and wood, fallen pine needles, earth and twigs and stones we had a spectrum from caves to pit dwellings from tents to lake dwellings. During class hours they fixed and pummelled; drew and wrote. Every bit of spare time was spent in looking for stones that might be used to make macroliths or microliths, stone tools ranging from a crude stone cutter to an axe. With a time limit of two weeks in hand, the students went to work. Within ten days it was all ready and on display. Each group contributed its findings and I just summed up by linking the lot together.

An added advantage with having all these models before one is that one can explain so much better. We looked into the flaws of pit dwellings, how man went on to build a better

home. We looked into locations (up river, down river etc) and so could arrive at what kind of economy the village would have, how it could have grown into a township etc.

I must mention here that one child had taken up "pottery" all on his own and shown the evolution of pottery from simple mud bowls to baked ones. In his lecture to us he even hazarded a guess as to how early man might have arrived at the idea of baking of clay. Yet another group gave us a surprise item on "the invention of the wheel". They did this in the form of a play, combining facts and their imagination.

The next chapter in the text deals with the urbanisation of Man. All I did initially was to give an introductory lecture and the children went about reading, bringing their findings to class and discussing. All this activity and involvement on their part gave them a taste of History as they had never had before. It also stuck fast in their heads. Given a test, not one of them scored below $6\frac{1}{2}$ on 10.

We studied each civilisation in detail and touched upon a number of subjects from Geo-

graphy to Sociology, Economics to Anthropology. The children became so interested that they kept asking for more things to do. We began a "language" of our own and developed it. We spent ten minutes talking in that language. Any new idea to be conveyed would result in a new word. One of the children fell ill and went into hospital. We wanted to send him a letter and so we began the script to our language.

You might feel that this kind of work, this method of doing History is very time-consuming and tedious. Believe me it just sounds that way. If anything, things move faster because each child is so "tuned in" that he receives and sends out lot more!

If one sits down to it, one can think up interesting, exciting and fun practicals for History and not just stick to plotting time lines and visiting tombs, though these have their own uses. Try it, your students will like it.

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Viewing 'Time' Through The Child's Mind

There are two rather different levels at which the concept of 'time' can be considered. The lower level is the one where 'time' is described, measured and arbitrary units are used for its manipulation. On a higher level one tries to understand everything about time - the succession of events, intervals of time, the movement of objects within time intervals, the relationship of speed to distance and the time of travel. Concepts in both levels develop simultaneously rather than one after the other.

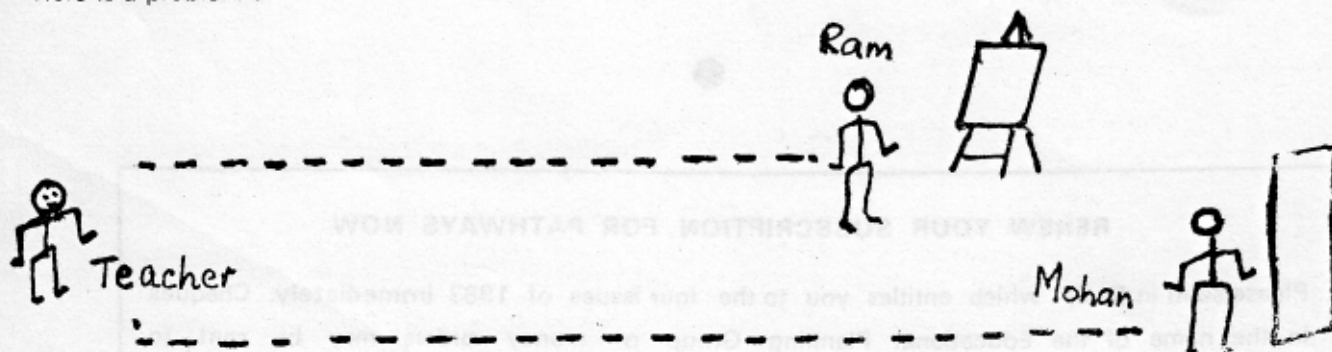
Succession and Duration of Events : For a child who has just entered school, time is related to personal experiences-story time, bed time, time to go home etc. A departure from a routine disorients many children. For example a mother collecting her child early from school is sometimes taken as a signal to go home by others in the class

With added experience comes a firmer grasp of the sequence of common events in daily life. These events are gradually seen, not in isolation, but as **being connected together is a pattern, the duration of any event being the interval between the time it begins and ends.** The closer these two 'points' in time the shorter the duration of the event. Likewise the duration of an event depends upon the succession of its beginning and end.

It takes some time for children to understand that they must fit their own actions in with others' time. 'Age' is a concept brought in with the celebration of birthdays. Early ideas of age are often related to the height (i.e. physical growth) of children.

From concrete examples of time passing continuously in a clock, children should be trained to think in more abstract terms about the continuity of time. Only when abstract thinking has been developed in children can they appreciate large numbers and large distances as in tracing the history of evolution and the beginnings of the universe.

Some basic misconceptions about time in relation to speed and distance exist. Here is a problem :

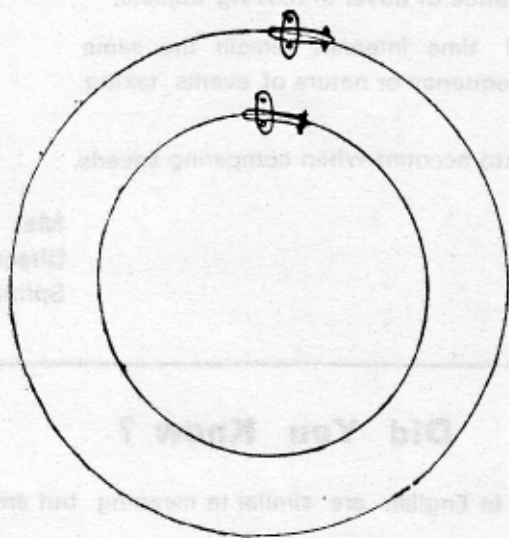


The teacher asked Ram and Mohan to walk across the room together, keeping in step with each other, until they came to the blackboard. Ram stopped there and Mohan was to carry on to the door. When Mohan was at the door the children were asked who had moved faster. Both children said, "Mohan", because he had walked further.

Students tend to consider time through their notions of speed rather than vice versa The third aspect of distance has to be taken into account in order to use the relationship between time and speed and invariable one of these three aspects is overlooked. Such limited

concepts of interpretation have important consequences for their safety when it comes to judgments which involve the speed of vehicles moving along a road which the children wish to cross.

A grasp of time/speed/distance relationships comes gradually as children grow up. Qualitative exploration of such relationships at an early stage will therefore be helpful.



Here is another problem which might be posed. Which aeroplane is going faster if each has to make one complete circle during the same period of time?

Analytical questioning with such examples leading on to the time taken by an hour hand and the minute hand in a clock will clarify basic concepts of time.

Activities which involve and help develop ideas about time :

1. Sand and water play with containers with holes at varying levels and of different sizes, using words like 'quick', 'slow', 'fast'.
2. Ordering daily activities in sequence using 'before', 'after', 'sooner', 'later'.
3. Retelling simple stories, putting events in order of sequence, using dramatic play.
4. Keeping a calendar with names of days and months, marking events on a calendar.
5. Celebrating birthdays, discussing age, getting older.
6. Playing with mobile toys on slopes of varying gradients. Comparing rates of movement of clockwork toys.
7. Telling the time, using words like 'minute', 'hour', 'quarter to', 'quarter past'.
8. Directed activities involving different rates of movement in physical education and musical activities.
9. Dramatic play and story writing to develop an appreciation of a succession of events.
10. Constructing and calibrating timing devices like sand, water and shadow clocks.
11. Working out time intervals and duration of a series of events—timetables, cooking, twenty-four hour clock . . .
12. Timing events and activities—the swinging of a pendulum, races, personal activities, heart beats,

By observing a child, the teacher should be able to judge which stage in the development of his 'time concepts' has been reached. The following may serve as a rough guide in selecting appropriate activities from the given list of suggestions.

- | | |
|--|-------------------------|
| a) Behaves as if he has his own time which is only occasionally linked to the time of other. | nos. 1, 2, 3, 4, 5 |
| b) Uses events in his daily routine to mark the time and judge time intervals | nos. 1, 2, 3, 4, 5 |
| c) Appreciates time is the same for everyone and knows the sequence of common events in his experience. | nos. 3, 4, 5, 6, 7 |
| d) Unable to take into account differences in speed when comparing the time or distance of travel of moving objects. | nos. 4, 5, 6, 7, 8 |
| e) Recognises that two equal time intervals remain the same regardless of the speed, frequency or nature of events taking place in them. | nos. 6, 7, 8, 9, 10, 11 |
| f) Takes distance and time into account when comparing speeds. | nos. 8, 9, 10, 11, 12 |

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Did You Know ?

Many pairs of words in English are similar in meaning but are often mixed up in usage. Here are three examples.

'Continual' means 'frequently repeated', while 'continuous' means 'without interruption'. Used in sentences one might say :

His **continual** chatter was most annoying.

It rained **continuously** for two hours.

'Uninterested' means 'not at all interested', while 'disinterested' means 'detached, objective'. Thus;

I am **uninterested** in politics.

An umpire should be **disinterested**.

There is a difference between 'put' and 'keep'. The word 'put' is used when you place something somewhere. To 'keep' means to 'continue in a specified state'. Many people use 'keep' when they should be using 'put'.

I **put** my pen on the table.

I **put** my suitcase under the seat.

She **put** her hand on her bag.

She **put** her jewels in the locker yesterday as that is where she **keeps** them.

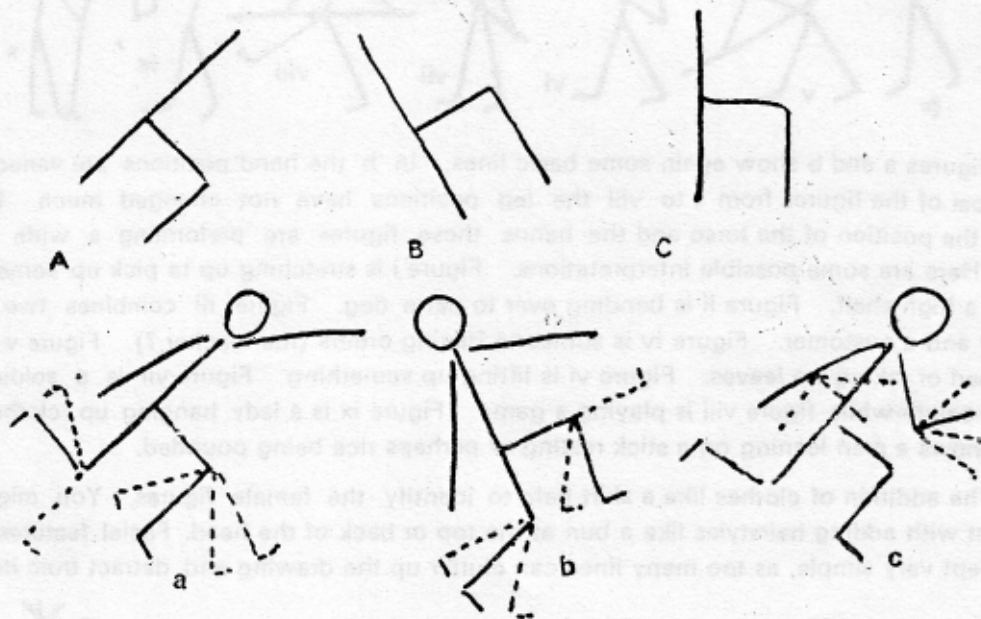
Put the pen in the drawer. That's where I **keep** it.

Pictures Make Your Lessons 'Special'

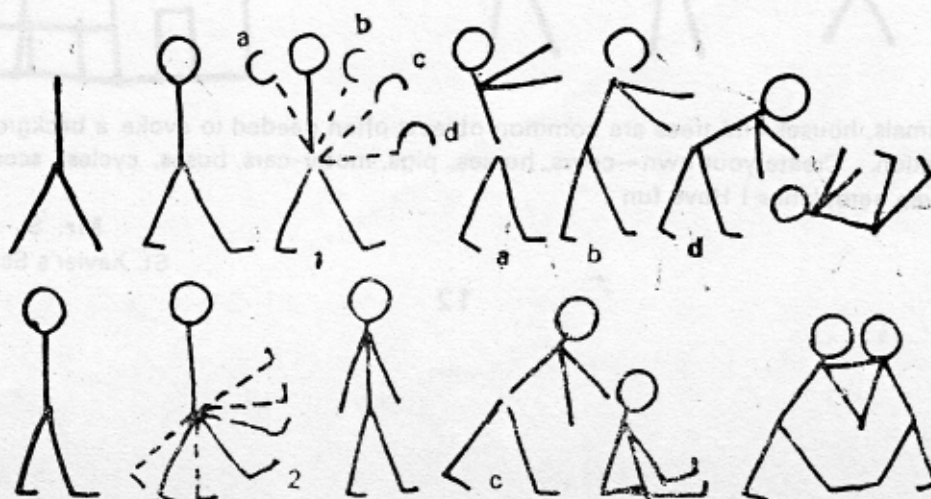
How often one has heard a teacher say, "I wish I could draw pictures"

Well it isn't all that difficult and with a **little practice**, you should soon be able to make story time, grammar lessons, science, mathematics, almost any lesson come alive. In the figures given below, I have tried to illustrate the art of drawing simple stick figures. Study them carefully and then **spend a few minutes every day drawing** one or two poses repeatedly till you are sure of the lines. You will soon reach a stage when you will not need to look at these figures for reference. After that a whole lot depends on your using your own imagination when to use pictures, how to change the postures very slightly to suit varying situations, how the same posture can mean different things in different contexts:

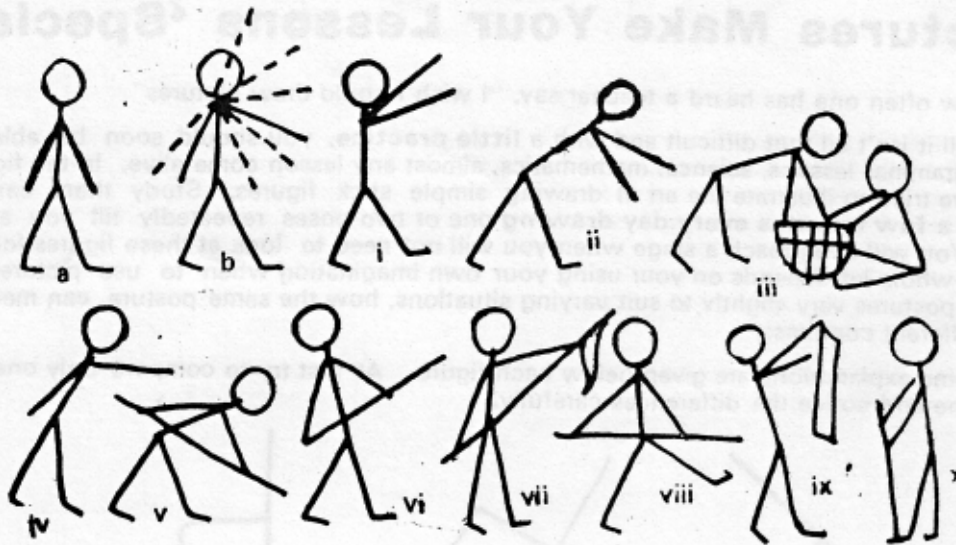
Some explanations are given below each figure. At first try to compare only one pose with the basic line and notice the differences carefully.



The basic patterns from which these figures are drawn are shown in A, B and C. Compare the figures in the second line with A, B and C. Legs now have two bends. Observe how 'movement' is created by the bending of the legs at knees and ankles. In each figure the dotted lines can be taken in pairs to obtain other postures. In 'a' and 'b' the legs change position. In 'c' the arms show the joint at the elbow and have four possible positions.

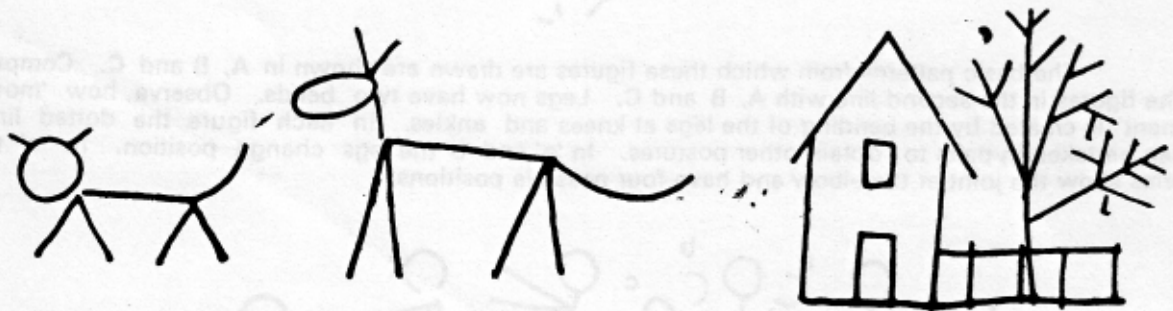


Here the basic structures are shown in the figures numbered 1 and 2. In figure 1, 'a', 'b', 'c', and 'd' show different positions of the torso. Notice how these can change the meaning of the stick figure. For example 'a' shows a person looking forwards and upwards perhaps greeting a friend. In 'b' he is leaning forwards. In 'c' (second line) he is bending over perhaps having noticed something on the ground; while in 'd' he is picking up the object on the ground.



Figures a and b show again some basic lines. In 'b' the hand positions are varied. Notice how in most of the figures from i to viii the leg positions have not changed much. By merely changing the position of the torso and the hands these figures are performing a wide variety of actions. Here are some possible interpretations. Figure i is stretching up to pick up something from on top of a high shelf. Figure ii is bending over to pat a dog. Figure iii combines two people a fruit seller and a customer. Figure iv is someone issuing orders (the teacher?). Figure v is digging a flower bed or raking up leaves. Figure vi is lifting up something. Figure vii is a soldier dipping his flag in salute while figure viii is playing a game. Figure ix is a lady hanging up clothes to dry. Figure x shows a man leaning on a stick resting or perhaps rice being pounded.

The addition of clothes like a skirt help to identify the female figures. You might like to experiment with adding hairstyles like a bun at the top or back of the head. Facial features, if needed must be kept very simple, as too many lines can clutter up the drawing and detract from its appeal.



Animals, houses and trees are common objects often needed to evoke a background for the story or situation. Create your own—cows, horses, pigs, motor-cars, buses, cycles, scooters, trains, ships and even aeroplanes! Have fun!

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PLAYING WITH SAND

Play is the young child's way of coming to terms with his world. During his play he will explore and discover much about his environment, express his feelings—of pleasure, fulfilment, unhappiness and frustration, satisfy his innate curiosity and in the process learn a great deal. Access to a wide variety of natural materials, among them sand and water, help in this process.

Sand is one of the basic materials which can help a child develop many concepts. It will provide him with opportunities to observe and recognise similarities and differences in shape, colour, texture. Playing with sand and suitable equipment helps improve muscular coordination. Many experiences arise which form the basis of early learning in mathematics and science.

Many of our schools have sand pits which while used by senior students for games, are rarely visited by juniors. It is important to ensure that if young children are going to play in the sand, it is clean and does not contain any sharp material like broken stones or bricks. A hard surface surrounding the sand pit, makes it easy to sweep up spilt sand. This is also an area where clothes, shoes, hands and feet can be dusted before returning to class. Nearby grass surfaces can provide contrasts. An edging of bricks or smooth concrete will help keep the sand in place. A sandpit which is in the sunlight, away from areas where water might stagnate during rainy weather, and protected from stray animals is usually easy to maintain. In an outdoor pit it may be advisable, especially in summer to keep the sand slightly damp.

Equipment which would help the children in their activities would include small buckets, rakes and spades, moulds of various shapes, empty tins and containers of different sizes and shapes, funnels, sieves, bottle tops, pebbles, twigs, small toys cars, trucks, paper and plastic bags, cardboard boxes and so on. For older children a pulley with a strong rope would help

them gain first hand experiences about height and weight. Large magnifying glasses might be used to examine the sand.

Early exploration by young children at the sand pit will include experiences like feeling the sand, **comparing** it with other surfaces, **observing its properties**. It can run through the fingers when it is dry but will stick to the hands if wet. When wet it can be **moulded** into different shapes; it can be dug up and piled up. Dry sand can be **poured** from one container into another. It will pass through funnels. Scoops and spades can be used to **smooth down** and **level** the sand, to build it into shapes. Sand falling on different surfaces makes a **variety of sounds**. Are the sounds made by wet and dry sand the same? Use a small container like an ice-cream cup, fill it with moist sand and invert repeatedly to **form patterns**.

Older children can use sieves to **sift** the sand and find out which grains remain in the sieve. Using sieves with large holes will permit sand to fall through **faster** than through small holes. **Sand patterns** can be formed with the fingers; a prelude to writing or drawing patterns in the classroom. Hand prints can be compared—large ones, and small ones, repeated in different ways to obtain patterns.

Tunnelling provides opportunities to observe how the sand falls down again from the sides. What steps can be taken to prevent a tunnel from collapsing? Try making tunnels that meet under the sand—a chance for a cooperative venture between two or three children?

Children can build houses, castles, forts, roads and lay out townships in the sand pit. The use of toy vehicles makes this exercise more realistic. How will it be possible to make sloping roads?

The use of **different size** containers can lead to exercises in estimation. How many times

can a small cup be filled from the big bucket? Or how many ice cream cups make up a given tin? Such exercise helps form early ideas about **capacity**. Terms like **more** and **less** begin to have meaning. The process of filling or emptying a larger container using a small one leads to **counting**. It can be extended to exercises in **repeated addition (multiplication)** or **repeated subtraction (division)**.

A simple balance can be improvised and used to compare the **weights** of containers filled with sand. If the containers are identical, do they always balance when full of sand? Is it possible to pack in more sand? Exercises in weighing give rise to concepts of **heavy** and **light**. The pulley will also help in this respect.

Concepts of time may be introduced in terms of **how long** it takes for sand to empty out of a tin with a small hole in its base. A sand clock may be improvised from a cone of paper resting on the neck of a bottle.

Objects used as moulds may be of different sizes—**large** or **small**. Perhaps they can even be arranged in order of size.

Identification of objects hidden under the sand, sorting out of tools or other objects into **sets** are some other possible exercises.

The teacher's role is important. Watching individual children at work will give insights into

their personalities. Individual work or play can gradually be steered into working in small groups—an early lesson in cooperation. The teacher needs to be on the lookout for violation of safety rules, for intervening in disagreements between children and to help those who cannot finish their allotted tasks.

Apart from all these, the most important job of the teacher is to **talk to the children** as they play, explore, experiment and react. This interaction between the teacher and the children is what leads each activity towards its logical conclusion, namely the formation of a concept or the learning of new vocabulary and skills. The list below gives a number of new words which may be introduced into **the mathematical vocabulary** of the children:

many	few	big	small
more	less	heavy	light
back	front	near	far
side		here	there
inside	outside	forwards	backwards
under	over	high	low
round	flat	up	down
another	one	fast	slow
balance		start	stop
weight			
same	different		

A COMPETITION FOR READERS

Did you enjoy reading Mr. Basu's article? Would you like to try your hand at drawing stick figures? PATHWAYS offers a **prize** to the best entry sent in to us **before March 31st 1983**. This will give you time to practise your new skills and use them to:

- illustrate a story that you might like to tell your class, or
- illustrate a lesson - **any subject** - that you might make more lively with such drawings.

Send in your drawings done with a black felt pen on white typing paper. Story or lesson outlines must be sent in with the illustrations.

We hope to print some of your efforts in the next issue.

BOXES, BAGS AND BOTTLES

The above theme lends itself to a wide variety of activities, making up a very interesting and imaginative project. Here are some possibilities. No doubt, readers will be able to think of many more. We would be happy to hear from anyone who tries out this project and would like to share additional ideas and reactions with us.

Boxes, bags and bottles are containers. They may hold solids, liquids or even gases! This suggests the possibility of a brainstorming session in the class. How many different kinds of boxes can you think of? what do they hold?

The most obvious boxes are those used to pack items - shoes, clothes, bottles and tins, medicines, soap powder, tea and so on. What about special boxes? Have you seen the odd shaped plastic boxes for eggs? Plastic, glass or cello-phane-fronted boxes belong to the see-through kind used to let us see the contents.

Soap wrappers are a special kind of attractive eye-catching box, usually advertising their contents. Bulbs come wrapped in a box of corrugated cardboard. Salt and pepper shakers are boxes with holes in them. Here are some more boxes:

A box in which people live—a house

A box that flies — an aeroplane

A box that moves on wheels—a car

A box that travels long distances on rails—
railway carriage

A floating box — a ship or a tanker

A box that goes up and down inside a
building — a lift

A box used to store grain—a silo

No doubt the children will be able to add to this list. It will provoke their imagination to think of such boxes.

Bottles may be made of glass, plastic, clay or metal. They come in different attractive

shapes and sizes. This provides opportunities of making a collection of interesting bottles and classifying them in different ways. They may be listed together with their contents and the volume of liquid they can hold. A market survey will help children strengthen concepts of the units in which the volume of liquids can be measured—litres and millilitres. Medicine bottles come in various sizes ranging from 5 ml to more than 300 ml. A teaspoon is approximately 5 ml and exercises in transferring or measuring out liquids will give children a practical idea of the size of the units used.

A **surahi** or earthenware jug is another kind of bottle. It might be possible for children to experiment with clay to form the shape of a **surahi** or to watch a potter at work.

Like bottles, bags may be made of many different kinds of materials—plastic, cloth, jute, paper, skin. A balloon is a rubber bag designed to hold air. Perhaps students might be able to investigate how hot air balloons work. They might also investigate the use of lighter-than-air balloons used for meteorological observations. What gases are used? Which one is preferred? Why? This might lead to reading the story of the airships made in the early part of this century.

Stories connected with boxes, bottles and bags are numerous. Here are some: Pandora's box, Aesop's fables about the Fox and the Stork, about the Crow and the Pitcher of Water. Aladdin and his Magic Lamp could be the basis for starting an imaginative story by the children: suppose they had a magic bottle from which a genie was released when it was opened ... Other interesting themes on which they might like to write:

*The postman brought me a parcel marked
"DO NOT OPEN"

*How I became a stowaway in a railway
container (or a ship's container).

Today goods are transported over long distances in huge boxes called containers. They are lifted on to ships, aeroplanes and trains by cranes and take less time and effort for both loading and unloading.

*Imagine you were one of the little people of Lilliput and had found a pile of small boxes which were big enough for you to climb into and explore. Think of how you could use them as a secret den and write about your adventures.

*The life story of a box of matches.

*When my father gave me a musical box ...

A student in the class may have a musical box which could be shown around in class, giving the children an opportunity to find out how it works.

*The box I found in the empty house.

Library investigations could include finding out how materials like glass, plastic and paper are made.

Craft work ideas on this theme are many. Children could learn how to make boxes out of stiff paper, how to wrap them neatly—gift wrapping, make a model house out of a collection of cardboard cartons of different sizes and furnish it, use empty match boxes to create a variety of furniture for the model house. Bottles may be painted or used as moulds for papier mache work. Most glass containers, even if they have unusual shapes, are symmetrical. To convey this idea of symmetry in an interesting way, children could make paper cut-outs of items like a bulb, a wine glass, a fish bowl, a milk bottle, a thermometer, a laboratory flask, a water glass, a mug. These could be mounted on paper of a contrasting colour to make silhouette pictures.

Bags may be made of different materials cloth, wool, plastic, paper, jute cloth—and decorated in a variety of ways using inexpensive materials. This offers scope for imaginative handwork.

A collection of labels may be pasted in a

scrap book. Children might like to design labels for their favourite foods.

Finally, some experiments on boxes, bottles and bags.

1. Make a dip stick; The materials needed are a large tin, a milk bottle and a straight stick about 50 cm. long. Pour in one bottleful of water at a time into the tin. On the stick mark off the level of each bottleful. The dip stick can then be used to measure approximately any unknown amount of water in the tin.

Why must the tin be kept on a level ground when measurements are taken? Can the same dip stick be used for other tins as well? Where do you think a dip stick might be useful?

2. Bulbs come wrapped in corrugated cardboard. Why do you think this is so? Take two fused bulbs, two equal pieces of cardboard one plain and one corrugated. Devise an experiment to find out the difference.

3. Can you think of a simple way of testing the strength of two bags of the same size, but made of different materials say plastic and paper?

4. Collect eight similar jars or glasses. Use a small cup or *katori* as a measure. Pour one cupful of water into the first bottle, two into the second, three into the third and so on. Take a pencil and tap the rim of the glasses. Observe the sound it makes. Find out if the amount of water makes any difference to the sound.

A variation of this experiment is obtained by pouring different amounts of water into eight identical bottles. Sound can be produced by blowing over the mouth of the bottle. The variation in the sound with the amount of water can be studied.

5. Find a packing case that has been used to hold other boxes—example tea cartons come packed in cardboard boxes. Measure the length breadth and width of the packing case. Check the length, breadth and width of the smaller boxes. Find the relationship. How many small

boxes fitted into the packing case ?

What other sizes of smaller boxes might fit into the same packing case ? Calculate — then try it out.

6. Is it possible to roll a tin on the floor in such a way that it comes back to you ? Pierce two holes in the lid and base of the tin. Cut a long rubber band so as to get a single long piece of rubber. Pass the stretched band through the holes you have made in such a way that it forms a cross inside the tin. Knot the band on the outside. Tie a small heavy weight at the cross—a stone or an iron object. Close the tin and roll it on the ground. What happens ? Why do you suppose this happens ?

6 Use two identical tins to improvise a simple balance. Make up a set of sand bags having weights of 1 kg, 500, 250 100 and 50 grams. To do this you will at first have to balance them against standard weights. Use your balance to weigh a wide variety of objects.

7. Take a broom stick or a thin straight twig. Tie a piece of string at its centre and hang it up so that it is horizontal. Tie on an empty balloon at one end of stick. At the other end (at the same distance from the centre) tie on another balloon of the same size **after blowing it full of air**. What do you find ? Why ?

The number of experiments that can be performed with tins, boxes, bottles and bags is enormous. Only a few are given here. Look for many others. They can be used to learn many important scientific principles.

OUR INDIA

There'll always be an India,
Where there's a country lane,
Wherever there's a hut so small,
Beside a field of grain.

There'll always be an India,
Where there's a winding street,
Wherever there's a turning wheel,
A million marching feet.

Saffron, white and green,
What does it really mean ?
Surely you're proud !
Shout it aloud !

Indians always, all be loving and true,
We can depend on you,
Freedom remains,
Gone are the chains.

There'll always be an India,
And India will remain free
If India means as much to you
As India means to me.

Mrs. P. Washington
St. Xaviers School, Delhi

Strength of mind is the king of qualities.
If you can't win, make the winner look great.
Prejudice vitiates research.

A Workshop on Mahatma Gandhi

Ms. Neelum Kapur

St. Thomas School, New Delhi

Mahatma Gandhi valued children and once said, "Children are my life". But the question today is, do children value him in turn? To discover what Mahatma Gandhi means to children today UNICEF initiated several workshops in Delhi schools. Our school was one of them.

A group of twenty enthusiastic girls from Std. VIII were chosen, for the workshop. To ensure spontaneous and voluntary reactions the participants were not told in advance what would be the subject of discussion. They were given a scenario and asked to do role plays. Thereafter, there was a general discussion about their individual reactions to various given situations. The reactions were in the form of value judgements.

After the discussion the students were taken to the Gandhi Darshan Museum near Rajghat where they were shown a film on the life of Mahatma Gandhi and also presented with a book each about his childhood.

The group reassembled the next day to reappraise our views and value-judgements. Subconsciously the girls began to compare their responses and reactions to similar real-life situations in Mahatma Gandhi's life and what his responses and reactions were. On comparison, a number of participants discovered that their value judgements were substantially different from Mahatma Gandhi's. To most of them, the ideas and values cherished by Mahatma Gandhi were a revelation. Even this brief exposure at the museum set them rethinking and re-evaluating their earlier responses. Instead of stuffing the students' minds with dry facts on Mahatma Gandhi, the workshop afforded them a stimulating and rewarding experience.

At the same time, there were a few girls who were more fascinated by revolutionary men like Subash Chandra Bose and Bhagat Singh than Mahatma Gandhi. To these young minds, quick and ready solutions were more appealing than the seemingly passive and slow solutions of a saint like Mahatma Gandhi.

Mahatma Gandhi, the moral force that mobilised a whole nation into a revolutionary movement in his own way, only a generation ago, has been reduced to classroom lessons to be remembered only for examination purposes. After the workshop the students were motivated to visit Gandhi Darshan yet again, and to start a project on his life and teachings. We are grateful to UNICEF for initiating such a worth-while and educative workshop.

Words of Success

"I would not dream of asking my subordinates to do anything which I am not prepared to undertake myself," writes Melendez. "I also find it useful to tell them what I consider to be the difference between a boss and a leader." Among those differences are: The boss uses "I." The leader uses "we."

The boss creates *fear*. The leader inspires *trust*. The boss "*knows how*." The leader "*shows how*." The boss *orders*. The leader *asks*. The boss relies on his *authority* to get things done. The leader relies on *co-operation* to get things done. The boss provokes *resentment*. The leader fires *enthusiasm*.

IN PRAISE OF WORKING MOTHERS

--by Malavika Karlekar

In my generation—that is, in the 30+ age group—people still ask, can a woman who is employed outside the home be a good mother? For our children, this question will be irrelevant: a combination of inflation and women's lib will take care of all doubts. Who is a good mother anyway? Is she one whose sole concern is her children, for whom she cooks, cleans and organises all day, is all attention when they return from school, supervises homework, escorts them to dance class or cricket lesson, tells bedtime stories ... it can go on forever. Yet, at the drop of a hat, she complains of today's children and how difficult it is to satisfy all their demands. The list of demands, of course, grows by leaps and bounds.

The supposedly not-so-good mother creeps into house after a tiring day at the office; accusations galore await her—the **dhobi** came early, the **chappaties** were hard at lunch, the cricket coach didn't turn up—and just as well, because the sports socks have had holes in them for weeks! And where is the good father in all this? Hard at work of course, earning the family's bread and butter. He is not to be disturbed at the end of the day with mundane details of daily life. He puffs reflectively at his cigarette as he watches the T. V. news, unperturbed by the string of complaints emerging from the kitchen, where a guilt-ridden woman frantically struggles with **gaajar ka halwa** to sweeten ruffled tempers.

It's not always so grim of course. The working mother is increasingly able to lay down the terms and conditions of her employment at home. The teenaged son or daughter is now old enough to cycle down to the market for odd jobs, while the little one has actually learned to lay the table if not wash the dishes. And the father? Negotiations with the toughest customer are still under way, but there is every indication that the war of attrition is catching up, and as for views on the sharing of house work, who can claim not to be for the dignity of labour? So why not cash in on such sentiments, particularly when the Gandhian re-discovery is on.

Who does one put one's money on them? The full-timer, or the part-time mother? Not an easy question to answer, but what is easy to establish is that it is the quality of the relationship which matters. Increasingly, children are beginning to resist constant supervision and accounting for the details of their day. A conflict of values and the generational gap lead to tension if the "I'm on duty all the time" mother is too demanding in what she expects of her children. Few teenagers appreciate, "We never wore such shoes! They were meant only for boys. Let me choose a nice pair for you!" Nor for that matter, can the mother like being put in her place with "Oh Ma! You are so phased out!" So, retire into the role of part-time mother, and a diversion of energies, where, hopefully, one is more appreciated. And if not appreciated, at least rewarded—unlike the work at home—with a pay packet to buy those extra shoes and socks, and maybe honey and jam.

(Ms. Karlekar is a mother and a University research worker cum teacher. Would other readers like to add their views in the next issue of PATHWAYS? —Editor)